NARRATIVE

The office addition in Milan, Tennessee is approximately 6,000 square feet in area. Ventilation requirements of the American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE) were utilized in this study.

The Base Case concept for the heating, ventilating, and air conditioning (HVAC) system is an Air-Air Heat Pump system. The system would be controlled by thermostats located in respective zones.

The geothermal system utilizes very similar heat pump equipment as the water source heat pump system except heat is rejected and added via heat exchangers configured vertically in the ground. Each heat exchanger is located in a vertical bore about 300 feet deep. The building interior water loop is circulated via pumps to the "borefield" located outside, underground. Each bore contains a 1-inch supply and return pipe. The extent or number of bores determines the overall capability to reject heat or absorb heat from the constant temperature ground soil. Thus, no boiler or cooler is needed for the water loop. All of the heat exchange is confined to the borefield.

The geothermal units are capable of handling water loop temperature ranges lower than the usual water source heat pumps. This feature usually allows the heat pumps to operate at cooler refrigerant temperature, which allow greater mechanical efficiencies and extended equipment life. Therefore, energy and maintenance costs are significantly less than other concepts. Also, the statistical service life of this equipment is twenty years.

We selected high efficiency water source heat pumps as manufactured by Addison manufacturing with a C.O.P. of 3.8 and EER at 17.0 for use in the geothermal system scenario. Use of lower efficiency products would drastically affect utility cost savings.

A test bore was prepared and tested at the office addition project site to determine the actual ground temperature and thermal conductivity. The following results were found:

Thermal Conductivity	1.4 BTUs/hr-ft-f
Ground Temperature	60.0 Degrees F

The above values are favorable. The computed length of bores is about 4,500 feet, requiring about 15 bores, three hundred feet deep and 20 feet on centers. The Borefield cost was determined using $5.50 per bore foot.

The computed data for the geothermal concept indicates an annual operating cost savings of $885.00 in utilities, as compared to the Air-Air system. The comparison on a building basis is as follows:

Air-Air Heat Pump	$0.98 per sq. ft.
Geothermal System:	$0.83 per sq. ft.

NO DRILL LOG